

comparable to the legs of fossorial Coleoptera. Mr. Ashmead replied that many fossorial insects do not have fossorial legs. The legs of *Rhopalosoma*, however, he considers to be strictly fossorial. The spines on the tarsi are obviously for fossorial purposes. Mr. Schwarz, referring to the long spurs on the posterior tibiae, said that when such spurs occur in Coleoptera they never occur in fossorial species. Dr. Gill remarked that nature is not limited in fossorial adaptations any more than it is in any other adaptations. It is not necessary, therefore, that hymenopterous fossorial insects should resemble coleopterous fossorial insects. He showed that the method of fossorial adaptation differs decidedly with different fossorial mammals. Professor Uhler stated that, as a general rule, fossorial insects may be distinguished by the fact that the joints of the tarsi of the front leg are crowned by a chaplet of spines, which seem to be absent in this species shown by Mr. Ashmead.

—Mr. Howard presented the following paper for publication :

A COLEOPTEROUS ENEMY OF *CORYDALIS CORNUTUS*.

By L. O. HOWARD.

Corydalus cornutus is the largest Sialid in the North American fauna and is one of the most conspicuous and curious of our commoner insects. Its anatomy was studied by Leidy as early as 1848 and its larva and pupa were known prior to that time. Riley completed the life history of the species by his discovery of the egg-masses in 1876. Almost every detail of the anatomy, physiology, and economy of the species has been carefully studied by Comstock and his students and assistants at Ithaca, and, in fact, were the graduation theses of his students for the last 20 years published, we should have a complete anatomy of the larva of this insect which would be almost comparable to Lyonnet's famous anatomy of the larva of *Cossus*. It may be briefly stated that the eggs are laid in midsummer in flat circular batches, covered with a tough calcareous substance, upon the leaves of trees, upon rocks, and wooden piles overhanging or in close proximity to the water; in such situations, in fact, that the larvæ on hatching may drop into the water. Each egg-mass contains about 2,000 to 3,000 eggs and the diameter of the mass is a little more than $\frac{3}{4}$ of an inch. The larvæ of the insect are familiar to fishermen under the names "Dobson," "Crawler," and "Hellgrammite," and are commonly used for bait for black

bass and other fish. The insect is thus of some slight economic importance and derives some additional importance from the fact that while it is eaten by large fish, it retaliates by destroying smaller fish. No natural enemies of this species have ever been recorded. The species breeds rather abundantly in the Potomac river and in Rock Creek, and the egg-masses, looking like accidental splashes of whitewash, are often seen on the rocks along the shores of these streams.

In the latter part of July of the present year, Mr. R. S. Clifton, of the Division of Entomology, an enthusiastic boatman, noticed that certain egg-masses upon rocks on the Virginia side of the Potomac river above Georgetown contained small round holes, and suspected from this fact the existence of some parasitic or predaceous enemy. Upon close examination he saw a small beetle engaged in eating into an egg-mass. He did not capture the specimen, but, thinking that the observation might be of importance, he mentioned it to the writer, who, on August 4, joined him in an investigating expedition. This was about two weeks after the original observation. At the date of our visit we found hardly one egg-mass out of a very large number which had not been eaten into. The beetle was captured and later determined by Mr. Schwarz to be a variety of *Anthicus haldemani*.* Upon opening the egg-masses we were greatly interested to find the larva of the beetle. In some cases only one or two large larvæ were found in a single egg-mass; in other cases a large number—certainly more than a dozen—smaller larvæ were found, and in others larvæ of several distinct sizes were noticed. Living specimens were brought home and fed in confinement. It was at first supposed that the larvæ would transform without issuing from the eggs. This, however, proved to be incorrect. When fullgrown they wandered restlessly around and this fact was sufficient to indicate to Mr. Pergande, in whose care they had been placed, that they needed certain conditions for pupating which were not present in the open-mouthed vials in which they had been kept. He therefore transferred them to vials containing sand, into which they immediately crawled and in which they soon pupated. Two larvæ were placed with the sand on August 15. On August 19 they were still unchanged, but one of them had formed a kind of cocoon from the grains of sand. On August 22 this individual had transformed to pupa. On August 24 Mr. Schwarz went with Mr. Clifton to the same locality and secured further material. August 31 three larvæ obtained on this trip transformed to pupæ, and September 3

* Later Capt. Casey informed the writer that the species is his *A. hercicus*, described in *Annals N. Y. Ac. Sc.*, 8, 1895, p. 712.

two more transformed. On account of the interest attaching to the early stages of the *Anthicus*, no effort was made to rear the adult from material gathered, but all pupæ and larvæ in different stages were preserved in alcohol. Without doubt the beetles would have emerged before fall and the insect would have hibernated in the adult condition, as do its relatives. From these observations we judge that there is more than one generation, depending upon the amount of food and the length of time that these egg-masses are available for food. The larva grows rapidly and there must be other food than the *Corydalis* egg-masses for early individuals. It seems likely that the beetle ordinarily gnaws a hole in the egg-masses before laying its eggs, and it seems, further, that few eggs are laid by each beetle in a single egg-mass. Other beetles, however, visit the egg-mass subsequently in many cases, as the fact that larvæ of different sizes were found would show. In lifting apparently unattacked egg-masses for food for the larvæ taken, we were surprised to find in several cases that these masses contained young larvæ of the *Anthicus*, so that the beetle does not necessarily gnaw the characteristic large round hole in the egg-mass before ovipositing. Careful observations were not made on this point, but it is likely that the eggs in these cases were thrust under the edge of the egg-masses where no orifice existed, or perhaps a small hole which was unnoticed was made at such a point. The extent of the destruction of the *Corydalis* eggs in this way was extraordinary. An uninfested egg-mass could hardly be found among the hundreds which occurred upon the rocks along the stream and upon the piers of the Aqueduct Bridge.

There are three very interesting features connected with this observation: First, that the eggs of *Corydalis cornutus* have never before been known to be attacked by any insect; second, that this species of *Anthicus* is rare in collections; and, third, that very little is known about the early stages of any *Anthicid*. Messrs. Hubbard and Schwarz say that they have seen the leaves of trees overhanging the waters of the Grand river at Grand Ledge, Mich., white with *Corydalis* egg-masses, but with no signs of any insect attack upon them. The writer has seen the leaves of trees overhanging several streams in the vicinity of Ithaca, N. Y., similarly plastered with egg-masses, and, as above stated, the *Corydalis* has for many years been studied by Professor Comstock and his assistants, but Professor Comstock has written me, in reply to an inquiry upon the subject, that he has not noticed that the eggs are attacked by any insect at Ithaca. The immunity in these two cases may be due to the fact that the eggs are laid more commonly upon leaves and trees where the larvæ of *Anthicus* on emerging could not find a proper place to

pupate, or it may have something to do with the geographical distribution of the species. Mr. Schwarz informs me that up to this summer, neither Mr. Ulke nor himself had ever taken this species at Washington, yet on August 4 the writer could easily have captured a hundred had he so desired. Mr. Schwarz further informs me that with Mr. Hubbard he noticed a closely allied species—*Anthicus quadrilunatus*—in extreme abundance along the rocky shores of the canyon streams in Colorado and Utah, and that Chauliodes and large Perlids were extremely common at the same time. He is inclined to think, since Mr. Clifton's discovery, that the related species may feed upon the eggs of these Pseudoneuroptera. The discovery will, in fact, probably lead to the discovery of the early stages of other Anthicidæ which frequent the margins of streams.

On the occasion of Mr. Schwarz's trip, on August 24, most of the egg-masses had been destroyed and there were abundant indications of subsequent feeding upon the remains of the eggshells by several insects. He found the larva and the imago of a large Psocid engaged in this work and he also found two larvæ of an Anthrenus similarly engaged. One specimen of another species of Psocid was also found and a mite was seen feeding upon the egg remains. As the larvæ of the Anthicus grow and demolish the interior of the egg-masses, the cover becomes gradually lifted from its closely fastened border on the rocks, allowing easy entrance to these other insects, which feed upon the leavings. The cocoons of a small Drassid spider were also found in a few demolished egg-masses.

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NOVEMBER 7, 1895.

President Ashmead in the chair and the following members also present: Messrs. Mann, Linell, Hubbard, Gill, Heidemann, Marlatt, Benton, and Howard.

By unanimous vote Prof. Dr. Rudolph Leuckart, of Leipzig, was elected an honorary member. Dr. William Barnes, of Decatur, Illinois, was elected a corresponding member.

The President announced the death of the Rev. Dr. J. G. Morris, one of the founders of the Society, and made a few remarks about Dr. Morris's long and prominent career.

—Mr. Hubbard read the following paper: